Comparison of echocardiographic and invasive measures of volaemia and cardiac performance in critically ill patients.

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Online Data Supplement

Table E1. Echocardiographic variables for the 50 patients studied. Values are mean (standard deviation) or median [interquartile range].

VARIABLE	Value
LV end-diastolic volume index (mL/m^2)	53 [45-70]
Short-axis mid-papillary LV end-diastolic area (cm^2)	17 [12-22]
LV end-systolic volume index (mL/m^2)	30 [20-42]
Short-axis mid-papillary LV end-systolic area (cm^2)	8 [5-16]
LV ejection fraction (%)	45 (16)
LA volume (mL/m^2)	31 [22-38]
RA volume (mL/m^2)	28 [20-33]
IVC diameter (inspiration) (mm)	17 (6.4)
IVC diameter (expiration) (mm)	17 (6.7)
IVC distensibility (%)	4 [2-8]
Early mitral diastolic inflow velocity (cm/sec)	91 (24)
Late mitral diastolic inflow velocity (cm/sec)	65 [48-87]
Early diastolic medial mitral annular velocity (cm/sec)	6.3 (1.9)
Early diastolic lateral mitral annular velocity (cm/sec)	8.2 (2.6)
Early tricuspid diastolic inflow velocity (cm/sec)	50 [41-62]
Late tricuspid diastolic inflow velocity (cm/sec)	44 [36-52]
Early diastolic lateral tricuspid annular velocity (cm/sec)	6.4 [5.5-8.0]
Tricuspid annular plane systolic excursion (cm)	12 [10-16]
Global longitudinal LV strain (%)	-10 (3.8)
RV free wall systolic strain (%)	-12 (4.5)
RA strain (%)	18 [11-27]
Rate of rise in LV pressure (mm Hg/sec)	857 [660-1393]

Definition of abbreviations: LV = left ventricle; LA = left atrium; RA = right atrium; IVC = inferior vena cava; RV = right ventricle

Table E2: Estimation of mean systemic filling pressure and global heart efficiency by three different techniques.

	Upper limb stop-flow technique measurements	Analogue estimates using Thermodilution technique to measure cardiac output	Analogue estimates using Echocardiography technique to measure cardiac output
P_{ms} mean ± SD (mmHg)	26±5.2	19±3.9	18.5±3.7
E_h mean ± SD	0.51±0.17	0.36±0.12	0.35±0.12

Definition of abbreviations: P_{ms} = mean systemic filling pressure; E_h = global heart efficiency

Table E3: Agreement and correlation between estimates of mean systemic filling pressure by three different techniques.

	Bias (mmHg) ± SD	Levels of agreement (mmHg)	Correlation (r)	95% CI	*p*-value for r
Upper limb stop-flow technique *vs* Analogue estimates using Thermodilution technique to measure cardiac output	-6.9±0.84	-18 to 4.6	0.19	-0.1 to 0.44	0.20
Upper limb stop-flow technique *vs* Analogue estimates using Echocardiography technique to measure cardiac output	-7.46±6.1	-19 to 4.5	0.11	-0.18 to 0.37	0.48
Analogue estimates using Thermodilution technique to measure cardiac output *vs* Analogue estimates using Echocardiography technique to measure cardiac output	0.52±1.7	-2.9 to 3.9	0.90	0.82 to 0.94	<0.001

Table E4. Multivariate analysis of mean systemic filling pressure and selected echocardiographic variables used for assessment of fluid status. Correlations are described by the F-statistic with regression and residual degrees of freedom in brackets, the p-value and the adjusted regression coefficient.

VARIABLE	P_{ms} estimated by the upper limb stop-flow technique	P_{ms} calculated using thermodilution measurements of CO	P_{ms} calculated using echocardiographic measurement of CO
LV end-diastolic volume index (ml/m²)	F (7,37) = 0.94 p=0.47	F (7,35) = 1.16 p=0.35	F (7,37) = 0.38 p=0.57
LV end-systolic volume index (ml/m²)	r=0.33	r=0.43	r=0.38
RA volume index (ml/m²)			
IVC diameter (inspiration) (mm)			
IVC diameter (expiration) (mm)			
IVC distensibility index (%)			
E/e'			

Definition of abbreviations: P_{ms} = mean systemic filling pressure; CO = cardiac output; LV = left ventricle; RA = right atrium; IVC = inferior vena cava; E/e' = early mitral diastolic inflow velocity to early diastolic mitral annular motion velocity ratio.

Table E5: Agreement and correlation between estimates of global heart efficiency by three different techniques.

	Bias (mmHg) ± SD	Levels of agreement (mmHg)	Correlation (r)	95% CI	p-value for r
Upper limb stop-flow technique Vs Analogue estimates using Thermodilution technique to measure cardiac output	-0.15±0.12	-0.39 and 0.09	0.69	0.51 to 0.81	<0.0001
Upper limb stop-flow technique Vs Analogue estimates using Echocardiography technique to measure cardiac output	-0.17±0.12	-0.42 and 0.09	0.64	0.44 to 0.78	<0.0001
Analogue estimates using Thermodilution technique to measure cardiac output vs Analogue estimates using Echocardiography technique to measure cardiac output	0.02±0.06	0.1 and 0.13	0.87	0.78 to 0.93	<0.0001

Table E6. Multivariate analysis of global heart efficiency and selected echocardiographic variables used for assessment of cardiac systolic function. Correlations are described by the F-statistic with regression and residual degrees of freedom in brackets, the p-value and the adjusted regression coefficient

VARIABLE	E_h estimated by the upper limb stop-flow technique	E_h calculated using thermodilution measurements of CO	E_h calculated using echocardiographic measurement of CO
LV ejection fraction **TAPSE** **RV strain** **LV GLS**	F (4,26) = 0.23 p=0.92 r=0.19	F (4,26) = 1.16 p=0.35 r=0.40	F (4,26) = 1.22 p=0.33 r=0.40

Definition of abbreviations: Eh = global heart efficiency; LV = left ventricle; TAPSE = tricuspid annular plane systolic excursion; RV strain = right ventricular free wall longitudinal systolic strain; LV GLS = left ventricular global longitudinal strain.

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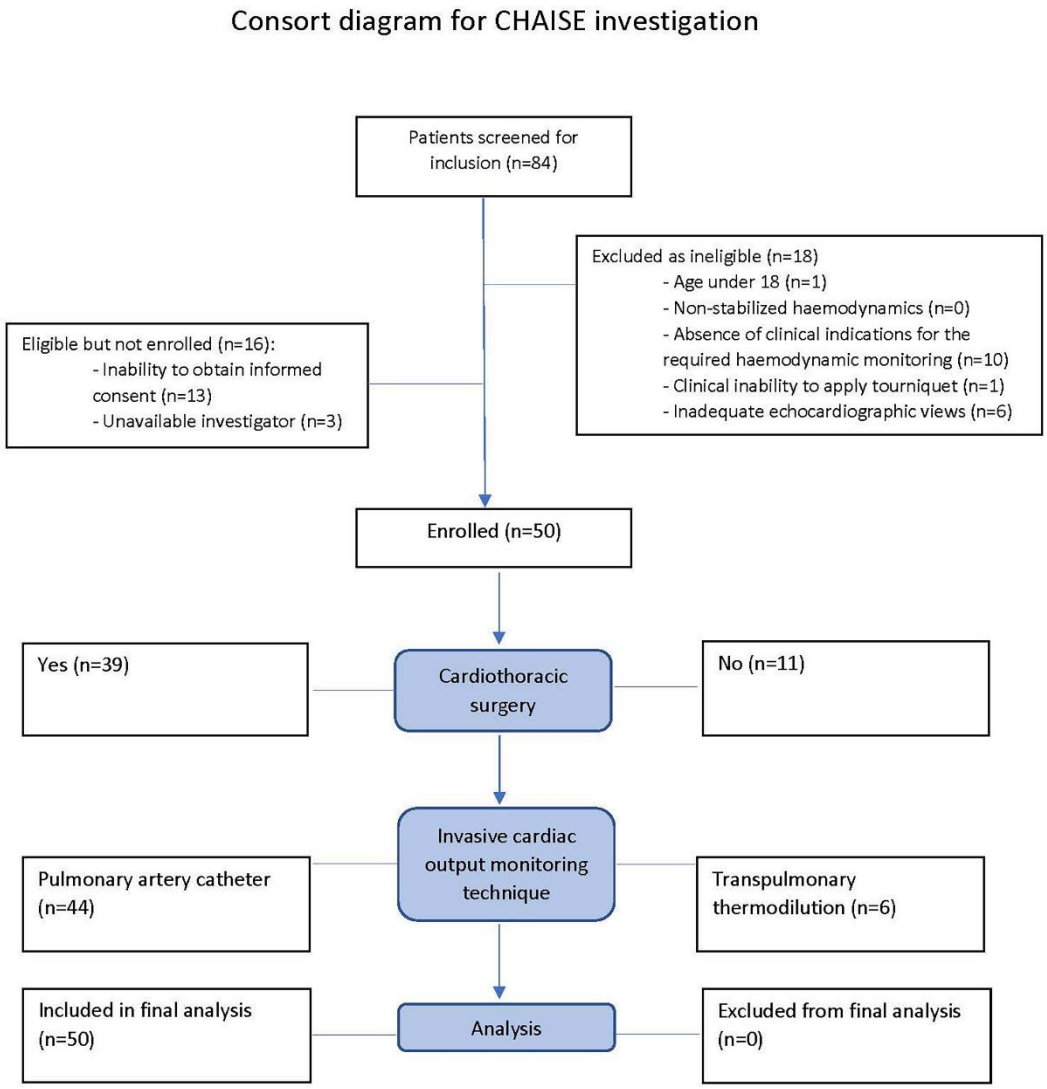

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